

UNITED STATES DISTRICT COURT  
DISTRICT OF MASSACHUSETTS

UNITED STATES OF AMERICA	)	
	)	
v.	)	CRIMINAL NO. 13-10200-GAO
	)	
DZHOKHAR TSARNAEV	)	

**MOTION TO EXCLUDE OPINION TESTIMONY CONCERNING  
POLYMER, TAPES, AND FIBER MATCHING**

Defendant, Dzhokhar Tsarnaev, by and through counsel, respectfully moves, pursuant to Federal Rules of Evidence 104(a), 402, 403, 702, 703, and the Fifth and Sixth Amendments to the United States Constitution, to exclude the government's proposed expert testimony that purports to match tape remnants and polymer substances recovered from the scene of the first Boston Marathon Bombing scene with certain items seized from the Tsarnaev family home at 410 Norfolk Street. Defendant submits that, at a minimum, the Court must schedule a *Daubert* Hearing to determine the admissibility of the proposed testimony.

As grounds, the defendant states the following: (1) there is no reliable scientific basis for this proposed testimony, and thus the testimony is inadmissible under *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993) and *Kumho Tire Co. v. Carmichael*, 526 U.S. 137 (1999); (2) the testimony is inadmissible under the 2000 amendments to Rule 702 in that (a) the testimony is not based upon sufficient facts or data, (b) the testimony is not the product of reliable principles and methods, and (c) the analysts who propose to testify to source-specific attributions have not applied the

principles and methods reliably to the facts of the case; (3) the subjective conclusions made by the analysts are so weak as to lack any probative value; and (4) any weak probative value of the proposed testimony is also substantially outweighed by the danger of unfair prejudice, confusion of the issues, and misleading the jury, and by considerations of undue delay, waste of time, and needless presentation of cumulative evidence and is thus inadmissible under Fed. R. Evid. 403.

### **FACTS**

The government has given notice that it proposes to introduce two FBI analysts, Andria Mehlretter and Joshua Friedman, to testify to associations between detritus recovered from the scenes of the two Boylston Street explosions and items seized from the Tsarnaev home at 410 Norfolk Street in Cambridge. Specifically, the government proposes to call FBI Chemist Andria Mehlretter to testify as follows:

She will testify that some of the components of tape, silicon sealant and wires recovered from the bombing scenes (all of which are specifically identified in her reports) are chemically consistent with tape and wires found at 410 Norfolk Street []. Specifically, she will testify that: (a) electrical tape and wires recovered from the Marathon crime scene and the Watertown crime scene are chemically consistent with each other; (b) a roll of silver duct tape, a roll of Black Gorilla duct tape, and a roll of Cohere packaging tape recovered from 410 Norfolk Street are chemically consistent with items of evidence recovered from the Marathon crimes scene; (c) Teflon tape recovered from 410 Norfolk Street is chemically consistent with Teflon tape recovered from the Watertown crime scene;<sup>1</sup> (d) sealant found with fragmentation and device components at Scene A on

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<sup>1</sup> To the extent that the government's disclosure indicates that Teflon tape is "chemically consistent," the disclosure conflicts with Ms. Mehlretter's report. The report indicates that due to the condition of the tape remnant recovered from Watertown, no comparison could be made. Mehlretter Tape Report 14. A copy of Ms. Mehlretter's report (hereinafter "Mehlretter Tape Report") is attached hereto as Exhibit B.

Boylston Street were colorless silicone rubbers, and at Scene B were a mix of colored silicone rubber sealant as well as an acrylic material; (e) sealants recovered at both scenes are chemically consistent with adhesion sleeves which embedded fragmentation recovered from victims at area hospitals; and (e) the sealants found on Boylston Street at Scene A, on Laurel Street, and among the victims' bodies are chemically consistent with a tube of silicone recovered from 410 Norfolk Street.

Gov't Letter of September 2, 2014 at 13 (attached hereto as Exhibit A). According to her report regarding the tape, a copy of which is attached hereto as Exhibit B (hereinafter "Mehlretter Tape Report"), the "consistencies" are (with one exception) characterized as "Level III Associations," which FBI protocol defines as

An association in which items are consistent in observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. Because other items have been manufactured that would also be indistinguishable from the submitted evidence, an individual source cannot be determined.

Mehlretter Tape Report 16.

Ms. Mehlretter characterizes the connections between silicone detritus (and one of the tape remnants) from Boylston Street to sealant (and a tape roll) found at 410 Norfolk Street as "Level IV Associations." Specifically as to silicone, Ms.

Mehlretter's report states:

Based on the comparative examinations conducted, the colorless silicones from Scene A, Laurel Street, and the Medical Examiner's office are all consistent with having originated from the same source or from different sources with the same chemical composition. Further, the Q691 tube of sealant cannot be differentiated from the various colorless silicone polymers from Scene A and Laurel Street, or from Q269.4 from the Medical Examiner's office. Therefore, Q691 cannot be eliminated as a possible source of these colorless silicones.

Ms. Mehlretter's Report of Wire Insulation and Polymer Analysis (hereinafter "Mehlretter Polymer Report") is attached hereto as Exhibit C. The FBI protocol defines a Level IV Association as:

An association in which items are consistent in observed and measured physical properties and/or chemical composition and, therefore, could have originated from the same source. As compared to a Level III Association, items categorized within a Level IV share characteristics that are more common amongst these kinds of manufactured products. Alternatively, an association between items would be categorized as a Level IV if a limited analysis was performed due to the characteristics or size of the specimen(s).

Mehlretter Tape Report 16; Mehlretter Polymer Report 11-12. The government further proposes to pair Ms. Mehlretter's testimony with FBI Forensic Examiner Joshua Friedman, who will testify that he:

determined that textile fibers recovered from tape on items affected by, or part of, the Marathon bombs are consistent with the color, construction and composition of duct tape (Q725) found at 410 Norfolk Street.

Gov't Letter of September 2, 2014 at 19.

The government's position appears to be that both Ms. Mehlretter and Mr. Friedman should be permitted to make source-specific associations without established methodology, without validation, and without resort to any statistical analysis, while also suggesting to the jury the inference that they can exclude the universe of other sources as the origin of detritus collected from Boylston Street.<sup>2</sup> Such testimony is prohibited by

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<sup>2</sup> Notably, the conclusion in Ms. Mehlretter's report is far more reaching than the government's September 2, 2014 disclosure. While the government has proffered that she will testify only that the items are "chemically consistent," the opinion expressed in her reports is indisputably source specific: she avers that the detritus "originated from" the 410 Norfolk sources she compared it to. *See, e.g.*, Mehlretter Tape Report at 12. As explained below, either iteration of the opinion must

*Daubert v. Merrell Dow Pharmaceutical*, 509 U.S. 579 (1993) and the Federal Rules of Evidence.

## ARGUMENT

### I. INTRODUCTION – THE COURT’S GATEKEEPER ROLE

As the Supreme Court has noted, “[t]estimony emanating from the depth and scope of specialized knowledge is very impressive to a jury. The same testimony from another source can have less effect.” *Ake v. Oklahoma*, 470 U.S. 68, 82 n.7 (1985) (citation omitted). Consequently, when a party moves to introduce scientific, technical, or specialized expertise this Court is obligated, under Federal Rules of Evidence 104(a) and 702, to act as a “gatekeeper” to ensure the evidence “is not only relevant, but *reliable*.” *Daubert v. Merrell Dow Pharmaceutical*, 509 U.S. 579, 589 (1993) (emphasis added); *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 141 (1999) (expanding *Daubert*’s holding to expertise deemed “technical” or “specialized knowledge” under Rule 702); *General Electric Co. v. Joiner*, 522 U.S. 137, 142 (1997). To faithfully carry out its gatekeeping responsibility, this Court must adhere to the principles articulated in *Daubert*, *Kumho Tire*, and *Joiner*.

In *Daubert*, the Supreme Court articulated the legal framework for how non-scientist federal judges are to distinguish between reliable science and “science that is junky.” *Kuhmo Tire*, 526 U.S. at 159 (Scalia, J., concurring). This framework entails considering five (non-exhaustive) factors. First, whether the forensic “theory or

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be excluded. At a minimum, a hearing *in limine* is required to resolved this discrepancy and ensure the parameters of any opinion she may be permitted to give.



technique... can be (and has been) tested.” *Daubert*, 509 U.S. at 593. Second, “whether the theory or technique has been subjected to peer review and publication.” *Id.* Third, whether the technique has a “known or potential rate of error.” *Id.* at 594. Fourth, whether there exists any “standards controlling the technique’s operation.” *Id.* Fifth, whether the technique is “generally accepted” by the scientific community. *Id.* These factors should assist district courts in determining “whether the reasoning or methodology underlying the testimony is . . . valid and . . . whether that reasoning or methodology properly can be applied to the facts in issue.” *Id.* at 592-593. Rule 702 further requires that the evidence or testimony “assist the trier of fact to understand the evidence or to determine a fact in issue.” Fed. R. Evid. 702. “[A] proposed expert witness must be sufficiently qualified to assist the trier of fact, and . . . his or her expert testimony must be relevant to the task at hand and rest on a reliable basis.” *United States v. Diaz*, 300 F.3d 66, 73 (1st Cir. 2002).

The key principles of Daubert are incorporated in Rule 702, which permits expert testimony only if:

- (a) the expert’s scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
- (b) the testimony is based on sufficient facts or data;
- (c) the testimony is the product of reliable principles and methods; and
- (d) the expert has reliably applied the principles and methods to the facts of the case.

Fed. R. Evid. 702. Pursuant to Rule 702 and *Daubert*, “[r]eliability questions may concern the expert's data, method, or his application of the method to the data. . . . The party offering the expert must show that the method employed by the expert . . . is scientifically sound and that the opinion is based on facts which satisfy Rule 702's reliability requirements . . . . [A]ny step that renders the expert's analysis unreliable . . . renders the expert's testimony inadmissible. This is true whether the step completely changes a reliable methodology or merely misapplies that methodology.” *United States v. Nacchio*, 555 F.3d 1234, 1241 (10th Cir. 2009) (*en banc*) (internal quotations and citations omitted). As the First Circuit has put it, “[i]f perscrutation reveals ‘that there is simply too great an analytical gap between the data and the opinion proffered,’ the expert's testimony should be excluded.” *Samaan v. St. Joseph Hosp.*, 670 F.3d 21, 32 (1st Cir. 2012), *citing Joiner*, 522 U.S. at 146, 118 S.Ct. 512.

Moreover, the proposed testimony must survive Fed. R. Evid. 403's proscription of evidence that wastes time, is confusing, or is unduly prejudicial. *Ruiz-Troche v. Pepsi Cola of P.R. Bottling Co.*, 161 F.3d 77, 81-82 (1st Cir. P.R. 1998) (“*Daubert* issues rarely arise in a vacuum, but, rather, frequently collide in practice with the requirements of other rules of evidence, especially Fed. R. Evid. 403.”). The burden of showing that all steps are scientifically sound and that the opinion is based on facts to satisfy Rule 702's reliability requirement and Rule 403's undue confusion requirement is on the government. *United States v. Monteiro, supra*, 407 F.Supp.2d 351, 356 (D.Mass. 2006) (“Because reliability under *Daubert* is among the preliminary inquiries a court must address under Fed. R. Evid. 104(a), the burden of proof with respect to reliability remains on the

proponent of the evidence.”); *Daubert*, 509 U.S. at 592 n.10 (citing *Bourjaily v. United States*, 483 U.S. 171, 175-176 (1987)).

**II. THE CONCLUSIONS THAT TAPE REMNANTS AND POLYMERS RETRIEVED FROM THE BLAST SITES ARE “CHEMICALLY CONSISTENT WITH,” “ORIGINATED FROM,” OR “THE SAME AS” ITEMS SEIZED FROM 410 NORFOLK ARE NOT SCIENTIFICALLY SUPPORTABLE BECAUSE THE METHODS EMPLOYED TO MAKE THE CONCLUSIONS LACK APPROPRIATE VALIDATION.**

The government proposes to have Ms. Mehlretter testify to certain tests she ran and the conclusions she drew from those tests. Specifically, she will testify that she examined the items using visual observation and a variety of tools, including a stereomicroscope, Fourier transform infrared spectroscopy (FTIR), scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM/EDS), X-ray diffractometry (XRD), pyrolysis-gas chromatography/mass spectrometry (py-GC/MS), polarized light microscopy (PLM), X-ray fluorescence spectroscopy (XRF), Direct Analysis in Real Time Mass Spectrometry (DART-MS), and Raman spectroscopy. She also took physical measurements. Ms. Mehlretter’s testimony presupposes that the results obtained through use of these tools are sufficient scientific support for her conclusion that the items recovered on Boylston Street are attributable to the rolls of tape and tube of sealant from 410 Norfolk Street. Similarly, Mr. Friedman’s proposed testimony suggests that, using a variety of microscopic techniques, he was able to conclude that the “characteristics” of the fabric backing of duct tape remnants recovered from the scene were “the same” as in the rolls of tape seized from 410 Norfolk Street. Because neither Ms. Mehlretter nor Mr. Friedman employed a validated methodology to



support the source-specific conclusions they drew from their comparisons, however, their opinions are insufficiently reliable and must be excluded.

Opinion testimony unsupported by appropriate validation fails to meet the standard of evidentiary reliability. *Daubert*, 509 U.S. at 590. To determine admissibility, a trial court must examine not only the methods and data relied upon by the proposed expert but also the conclusions drawn to determine whether they flow rationally from the methodology employed. *See Joiner*, 522 U.S. at 146; *Heller v. Shaw Indus., Inc.*, 167 F.3d 146, 153 (3d Cir.1999). Method validation is the lynchpin of scientific, and therefore evidentiary, reliability. *Daubert*, 509 U.S. at 590 n. 9 (evidentiary reliability will be based on scientific concepts of validity, *i.e.*, “does the principle support what it purports to show?”). If “there is simply too great an analytical gap between the data and the opinion proffered,” the expert’s testimony should be excluded. *Joiner*, 522 U.S. at 146.

Method validation in the pursuit of reliable scientific results is an acknowledged scientific concept implemented by all competent forensic laboratories, including the FBI. As laboratory auditor Janine Arvizu notes, to obtain and maintain accreditation as a forensic laboratory the FBI is mandated to adhere to the international quality standard set forth in ISO 17025, titled “General Requirements for the Competence of Testing and Calibration Laboratories.” Declaration of Janine Arvizu (attached hereto as Exhibit D) (hereinafter “Arvizu Declaration”) at 2-3. ISO 17025, which is attached hereto as Exhibit E, requires

that a test method be validated and determined to be appropriate for its intended use prior to use of the method to test unknown samples. The intended use of the test method, and the performance requirements for the method must be clearly specified.

Arvizu Declaration at 2.

Here, Ms. Mehlretter's opinion that tape remnants and silicone recovered on Boylston Street are "chemically consistent" and so "could have originated from the same source," and Friedman's testimony that some tape remnants are "consistent with the color, construction and composition" of tape from 410 Norfolk Street, purport to be source specific, *i.e. these* remnants came from *this* roll and *this* polymer came from *this* tube. To be reliable, the opinions as to source specificity must be supported by the validation required and defined by ISO 17025. As Ms. Arvizu explains,

It is the consensus of the scientific community that the use of validated methods is an essential prerequisite for reliable measurement results. Method validation is the process of defining an analytical requirement, then confirming, through empirical testing, that the method under consideration has performance capabilities that meet requirements for the intended use of the method.

Because the requirements of analytical methods differ with their intended uses, there isn't a single, uniform validation protocol that is applicable to all methods. Rather, the intended application of a method must be clearly defined, so that requirements for testing can be explicitly stated. During validation, the actual performance of the complete measurement procedure is determined through empirical testing, and the method's performance characteristics are compared to requirements for the intended use of the method.

Arvizu Declaration at 1-2. Here, Ms. Mehlretter's and Mr. Friedman's opinions were not the result of a validated protocol that could support a source specific attribution because the FBI does not have one. The absence of validated method for the intended

application to source-specific attribution renders Ms. Mehlretter's and Mr. Friedman's opinions scientifically unsound and thus unreliable pursuant to Rule 702.

To be sure, the FBI has standard operating procedures for the operation of the various instruments Mehlretter and Friedman employed, *e.g.*, FBI Chemistry Unit Standard Operating Procedure *Macroscopical and Microscopical Examination of Tape Evidence* (attached hereto as Exhibit F), Trace Evidence Unit Standard Operating Procedure *Fabric, Fabric Damage, Fabric Impression, Duct Tape, and Cordage Examinations* (attached hereto as Exhibit G). But those protocols are inadequate for the "intended use" of specific-source attribution and consequently cannot accomplish the "task at hand," *i.e.*, determining whether the tape remnant or polymer sample originated from an item seized from 410 Norfolk Street. *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 153-154 (1999). Nowhere in the FBI's Standard Operating Procedures ("SOP's"), or in the references contained within them, is there a definition of the analytical requirements to reach a source-specific attribution conclusion. *See* Arvizu Declaration at 2; ISO 17025 § 5.4.5.1. Similarly, there is no confirmation through empirical testing that the method used to support the opinion has performance capabilities – including assessment of the uncertainty of the results – that meet the requirements for source-specific attribution. In fact, the bulk of the studies cited in the SOP's are inapplicable to chemical composition because they concern fracture or end matching of tapes, a procedure not employed and of no relevance here. *See, e.g., Macroscopical and Microscopical Examination of Tape Evidence* at 12 (citing an article titled *A validation of physical associations of duct tape ends*). Of the remaining "studies," most are simply

tautological explanations of how the FBI Laboratory goes about testing items bereft of empirical support as to the source-specific method's reliability. *See, e.g., id.* at 13 (citing *Analysis and discrimination of electrical tapes*). At least one is simply of no value to the scientific endeavor at all. *See Fabric, Fabric Damage, Fabric Impression, Duct Tape, and Cordage Examinations* at 7 (citing, as one of its four reference studies supporting fabric attribution, a 1976 edition of the *Reader's Digest Complete Guide to Sewing*).<sup>3</sup> The general protocols do not purport to, and cannot, be intended for the intended use of source attribution.

The FBI's general Quality Assurance Manual, the Chemistry Unit's quality standards, and the Trace Evidence Unit's quality manual are all in accord in requiring a specific method validation protocol before the conclusions drawn from a particular test can pass reliability muster. The FBI Quality Assurance Manual § 5.4, attached hereto as Exhibit H, is titled "Examination Procedures and Procedure Validation." It mirrors ISO 17025 and mandates the following:

**5.4.5.1:** Appropriate validation studies are conducted on all new technical procedures used for the analysis of evidence.

**5.4.5.2:** Validations for new technical procedures are performed according to the LOM - Practices for Validating Technical Procedures and/or LOM - Practices

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<sup>3</sup> Significantly, five of the studies cited in *SOP Macroscopical and Microscopical Examination of Tape Evidence*, are articles published by the Pressure Sensitive Tape Council ("PSTC") and/or authored by John Johnson, identified by PSTC as the PSTC Technical Consultant Emeritus. *Id.* at 12-14. The PSTC's website and biography of Mr. Johnson can be accessed at <http://www.pstc.org/i4a/pages/index.cfm?pageid=3476>. Interestingly, Mr. Johnson has determined that the source-specific match Mehlretter and Friedman would opine here cannot be supported. A 2007 paper that can be accessed on the same PSTC webpage and attached hereto as Exhibit N, *Adhesive Tapes As Trace Evidence*, concludes that while there are methods of analysis to *exclude* source candidates, "[t]he only true way to know that the evidence tape originated from the suspect's tape is by matching the torn edges." *Id.* at 3-4 (emphasis supplied).

for Validating Chemical Procedures, as appropriate, to ensure the procedure produces reliable results. The validation process determines the limitations of the procedure, the conditions under which reliable results can be obtained, and the critical aspects of the procedure that must be carefully controlled and monitored. Units maintain records of the validation including, the procedure used, the results, and a statement as to whether the technical procedure is fit for its intended use.

**5.4.5.3:** When validating a technical procedure, the scope and accuracy will be assessed to ensure that the procedure meets the requirements of a given application.

**5.4.5.4:** The reliability of a validated technical procedure that is new to the FBI Laboratory is confirmed in-house against any documented performance characteristics of that procedure prior to first use. Records of performance verification conducted during the validation process are maintained in the units for future reference.

*Id.* The Quality Assurance Manual governing the Chemistry Unit, “Validation of Analytical Procedures,” attached hereto as Exhibit I, implements the FBI’s overall quality assurance manual by demanding that “all new analytical procedures developed” be validated “*prior to the procedure’s first use in casework.*” *Id.* at § 2. To comply, the unit must “develop, document, and ensure approval of a validation plan,” “[d]ocument and retain the results of the validation study,” and “[e]nsure approval of the validation study” through appropriate technical review. *Id.* § 3.1. Similarly, Friedman’s Trace Evidence Unit’s SOP, titled “Validation of Technical Procedures,” attached hereto as Exhibit J, requires that for “Non-standardized Technical Procedures” “the performance characteristics applicable to the intended purpose must be determined and appropriate validation experiments must be conducted.” *Id.* at § 4.3.3. Additionally, where, as here, the validation is case-specific, the Chemistry Unit is to maintain validation study records “in the related case notes.” Chemistry Unit, “Validation of Analytical Procedures” § 4.2.



The government has confirmed that the analysts did not employ a validated source-specific method to support the conclusion of matches of tapes and polymers. In response to the defendant's written request for the studies supporting the source-attribution conclusion, attached hereto as Exhibit K, the government replied

The studies and sources cited in the bibliography in her C.V. and supporting materials, including the SOPs for her lab's analysis have already been provided. In addition, we are providing you today with several similar publicly available sources from the Scientific Working Group for Material Analysis, of which she is a member. One of the documents specifically addresses the reliability and admissibility of analyses such as the one she did in this case.

December 15, 2014 Letter of Alope Chakravarty to William Fick, et al. (attached hereto as Exhibit L) at 2. Contrary to the government's suggestion, none of the eight documents validate a methodology that could support the source-specific conclusion Ms. Mehlretter and Mr. Friedman drew here. Missing from the documents are any studies supporting the two critical determinations necessary for a source-specific conclusion, *i.e.*, whether the tape rolls and sealant are properly *included* as sources and the definition of the universe of other sources that can be *excluded*. As Ms. Arvizu succinctly puts it,

[T]he presence of a given compound at identical concentrations in two different items of evidence does not necessarily mean that they share a common origin, or even a common method of manufacture. Similarly, the presence of a given compound at two different concentrations in two different items of evidence does not necessarily mean that they did not share a common origin or a common method of manufacture.

Declaration of Janine Arvizu at 3. Without a source-specific method validation supported by appropriate studies, the reliability of Ms. Mehlretter and Mr. Friedman's

conclusions cannot be established and consequently this Court cannot determine whether the opinions are reliable. *See* National Academy of Sciences, National Research Council, Committee on Identifying the Needs of the Forensic Science Community, *Strengthening Forensic Science in the United States: A Path Forward* (2009) (“NAS 2009 Report”) at 8 (emphasizing that forensic disciplines “need to develop rigorous protocols to guide these subjective interpretations and pursue equally rigorous research and evaluation programs.”).

Two examples from the “methodologies” relied upon here illustrate the principle. Ms. Mehlretter in a publicly available trade paper has lauded the utility of a tape reference library that she has maintained and relied upon to support discrimination in tape matches. *See* Mehlretter & Bradley, *Forensic Analysis and Discrimination of Duct Tapes*, *Journal of American Society of Trace Evidence Examiners*, August 2012. Absent from Ms. Mehlretter’s work in this case, however, was any physical or chemical comparison to the library and known reference samples to validate her conclusions that differences and similarities in the results she obtained in the various tests performed here were significant or insignificant. Such information is crucial to validation as it will define the range or scope of conditions within which reliable results can be obtained. Without incorporating the reference library into her analysis, understanding the variations in data – a key to any validation plan – is impossible.

The lack of method validation that is required to reliably guide an analyst is brought into even sharper focus by Ms. Mehlretter’s struggle when endeavoring to match

polymer material found at the bombing scene. Without a validated method available to guide her, she wrote to an associate professor of polymer science:

I am working a case with a couple different silicone rubbers. By different, I mean that I have a couple of different clear silicone caulk tubes to compare to silicone rubbers from a crime scene. What analytical technique would most likely allow me to differentiate silicone rubbers, or are silicone rubbers all pretty much the same?

Mehltretter Email Exchanges with Third Parties (attached hereto as Exhibit M), May 3, 2013 communication with James Rawlins. Professor Rawlins wrote back:

They can vary drastically, organic content, phenyl to methyl ratio, fluorinate or not and crosslinking chemistry can be drastically [sic]. NMR [Nuclear Magnetic Resonance] is ideal if you have it.

*Id.* Notwithstanding the advice that Nuclear Magnetic Resonance was the ideal test, no such testing was performed by the FBI. Instead, Ms. Mehltretter turned to tape industry contacts to assist her with her analysis. *Id.* at 2-8. While her attempts to sort out her analysis are understandable and even laudable as a matter of her pursuit of personal education about silicones, they are antithetical to the concept of method validated as required by ISO 17025, the National Academies of Science, and the FBI itself.

Faced with these facts, the government, in its response to defendant's requests for a source specific methodology and the extent of empirical validation, replies that the validation naturally flows from Ms. Mehltretter's training and experience. December 15, 2014 Letter of Alope Chakravarty to William Fick, et al. at 2. But reliance on training and experience is inimical to reliability, particularly where the evidence is purported to be "scientific." As one commentator has noted, scientific reliability requires that

[t]he forensic scientist must first determine what the characteristics are to be compared, then determine the weight to be ascribed to them, and then decide upon the number of matching characteristics that must be noted before a conclusion can be reached. This is more easily said than achieved, and may require de novo research in order to come to grips with the significance of observed characteristics.

Faigman, et al., *Modern Scientific Evidence: The Law and Science of Expert Testimony*, § 30:22. Friedman's conclusion of "sameness" as to the backing fiber of the tapes is similarly flawed by its reliance on training and experience and exclusion of demonstrated validation. As a leading treatise has noted,

The validity of fiber identification techniques is susceptible of objective testing, although this has not been accomplished on a scale and in such a manner as to satisfy Daubert. The error rate of fiber examination is unknown. The validity of the interpretation of the significance of a match in fiber evidence has not been subjected to systematic testing of the sort countenanced by Daubert.

Faigman, et al., *Modern Scientific Evidence: The Law and Science of Expert Testimony*, § 30:49.

History has taught that reliance on "training and experience" Mehlretter claims as support for her conclusions in lieu of empirical method validation has resulted in the repeated admission of now discredited completely "scientific" opinions, including

- **Dermal nitrate testing:** First admitted into a criminal case in 1936, *see Commonwealth v. Westwood*, 324 188 A. 304 (Pa. 1936), the forensic community failed to thoroughly research its validity until the late 1960s. This belated inquiry clearly established its unreliability, as it generated an intolerable amount of "false positives." *See* Paul C. Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century Later*, 80 Colum. L. Rev. 1197, 1224-25 (1980).
- **Voiceprint Identification:** Prosecutors and law enforcement experts vigorously pushed for the admissibility of voiceprint technology before they adequately researched its validity. For a period, the voiceprint advocates won many minor



battles, as various courts permitted voiceprint experts to testify about voiceprint technology. However, once scientists outside of forensic science began studying the technology, they raised several questions regarding its purported accuracy. The National Academies of Science settled the debate by concluding that insufficient data existed to substantiate voiceprinting's underlying theory. *See* Committee on Evaluation of Sound Spectrograms, National Academy of Sciences, *On the Theory and Practice of Voice Identification* 42 (1979).

- **Electrophoretic Blood Testing:** Prior to DNA testing, forensic technicians and prosecutors forcefully advocated for the admissibility of electrophoretic blood testing, as these tests supposedly “provided significant advances in the ability to tell one blood sample from another so that it [was] almost possible to determine whether a particular specimen of blood came from a specific person.” Jonakait, *Will Blood Tell? Genetic Markers in Criminal Cases*, 31 Emory L. Rev. 833, 851 (1982). Like voiceprinting and the paraffin test, electrophoretic testing was not thoroughly scrutinized and researched by forensic examiners before they started their admissibility campaign. Moreover, their campaign – and court admission of the testimony – continued despite the fact that the limited scientific literature available at the time contained “proven and potential areas of unreliability in the tests.” *Id.* at 912. It was not until years after electrophoretic testing was initially admitted that nonpartisan scientists were able to legitimately establish electrophoretic testing's questionable reliability. *See, e.g., People v Harbold*, 464 N.E.2d 734 (Ill. App. 1984); *People v. Young*, 391 N.W.2d 270 (Mich. 1986); *People v Holbrook*, 397 N.W.2d 832 (Mich. 1986); *People v Lewis*, 408 N.W.2d 94 (Mich. 1987).
- **Burn Pattern Analysis:** For more than three decades, arson investigators relied on anecdotal theories about fire dynamics and the meaning of particular shaped burn patterns to conclude whether a fire was intentionally set. These theories were never empirically tested until the late 1990s. Once the U.S. Fire Administration published the results of empirical research, “[s]everal of the ‘old fire investigator’s tales and fire investigation misconceptions... were... shown to be unsubstantiated by the... testing.” John J. Lentini, *The Scientific Basis of Expert Testimony on Fire, Arsons, and Explosions*, in *Science in the Law: Forensic Science Issues*, 359 (David L. Faigman et al., eds. 2002). A group of independent experts recently demonstrated that Texas executed an innocent man based on junk arson science. *See* Arson Review Committee, *Report on the Peer Review of the Expert Testimony in State of Texas v. Willingham and State of Texas v. Willis* (April 2006).<sup>4</sup>

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<sup>4</sup> Available at: <http://www.innocenceproject.org/docs/ArsonReviewReport.pdf>.



- **Comparative Bullet Lead Analysis (CBLA)**: For more than thirty years, the FBI used comparative bullet lead analysis (CBLA) to secure convictions in circumstantial cases. CBLA's primary assumption, like Mehlretter's and Friedman's as to tape and sealant here, is that each batch of lead which produces bullets is unique and thus no two batches will ever have similar or identical compositional signatures. After initial independent research called into question the validity of CBLA's metallurgical premises, however, the FBI in 2003 finally requested the National Research Council (NRC) to exhaustively research these premises to determine whether they were legitimate. The NRC's report concluded that CBLA was premised on faulty metallurgical premises. *See* National Research Council, *Forensic Analysis: Weighing Bullet Lead Evidence* (2004). The NRC report, other literature finding the technique faulty, and court rejection of the testimony (*see United States v. Mikos*, 2003 WL 22922197 (N.D. Ill., October 31, 2005)) compelled the FBI to abandon the technique despite its use in securing convictions over a thirty year period. *See* United States Department of Justice, Federal Bureau of Investigation Press Release, *FBI Laboratory Announces Discontinuation of Bullet Lead Examinations*, September 1, 2005, available at <http://www.fbi.gov/news/pressrel/press-releases/fbi-laboratory-announces-discontinuation-of-bullet-lead-examinations>. ("The FBI Laboratory today announced that, after extensive study and consideration, it will no longer conduct the examination of bullet lead. . . . One factor significantly influenced the Laboratory's decision to no longer conduct the examination of bullet lead: neither scientists nor bullet manufacturers are able to definitively attest to the significance of an association made between bullets in the course of a bullet lead examination.") The fallout from admission of this scientifically flawed methodology continued for several years after the FBI abandoned that brand of analysis. *See* United States Department of Justice, Federal Bureau of Investigation Press Release, *FBI Laboratory to Increase Outreach in Bullet Lead Cases*, available at <http://www.fbi.gov/news/pressrel/press-releases/fbi-laboratory-to-increase-outreach-in-bullet-lead-cases> ("the FBI Laboratory announced today that it has undertaken an additional round of outreach, analysis, and review efforts concerning a discontinued forensic test known as Bullet Lead Analysis, or BLA.").

In sum, to admit testimony of the kind proposed by the government here, unguided by the kind of methodology the NAS 2009 and the scientific community now demands of forensic science, carries a substantial risk of grave error. *See* Saks and Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 Science 892 (2005) (reporting that forensic testing errors were responsible for wrongful convictions in 63%

of the 86 DNA exoneration cases reported by the Innocence Project). The National Research Council finding that “[i]n a number of forensic science disciplines, forensic science professionals have yet to establish either the validity of their approach or the accuracy of their conclusions, and the courts have been utterly ineffective in addressing this problem,” directly applies to both Mehlretter’s and Friedman’s conclusions here. Lacking method validation, their opinion testimony must be excluded.

*Daubert* analysis of tape and polymer composition matching by courts has been rare, and no court appears to have considered the lack of method validation for the task. In *United States v. Zajac*, 749 F.Supp.2d 1299 (D. Utah 2010), the sole reported modern federal case considering the issue, the court permitted an ATF analyst to give her opinion on the “consistency” between two samples of adhesive polymer. *Id.* at 1306. The *Zajac* court did so because it concluded that testimony of the “consistency” was supported by the analyst’s use of instruments similar to those used by Mehlretter and Friedman here. *Id.* Even then, the court’s unease with the opinion resulted in a limitation of the opinion; the court would not allow the analyst to testify to her conclusion that the adhesives “could have come from the same source.” *Id.* at 1307.

The *Zajac* court did not appear to have, as this Court does, evidence of the lack of method validation for source-specific attribution that is required by the NAS, ISO 17025, and the FBI itself. Those materials show that whether an analyst reliably conducted instrumental tests is not, as the *Zajac* court incorrectly concluded, *see id.* at 1306, the end of the inquiry. As one commentator puts it,

there is a critical distinction between an observation and its interpretation. An observation is a determination or measurement made under a controlled set of conditions. Interpretation, on the other hand, is the intellectual endeavor that assigns a meaning to the observation in the light of scientific knowledge. These two elements may be summarized as "What things are," and "What things mean." . . . The court could be convinced of the technical soundness of the opinion, but would be forced to guess as to how that opinion should be factored into the totality of the case. From the standpoint of the court, or a jury, this would be equivalent to listening to an obscure Japanese *Noh* drama without the benefit of the plot.

Faigman, et al., *Modern Scientific Evidence: The Law and Science of Expert Testimony*, § 30:31. Without methodology validation this Court is simply unequipped and unable to gauge the reliability of Ms. Mehlretter's and Mr. Friedman's conclusions and, as such, their opinions must be excluded.

### **III. LIMITING THE OPINIONS TO "CONSISTENT WITH" RUNS AFOUL OF RULE 403.**

As noted *supra*, the *Zajac* court permitted testimony regarding associations between two samples of polymers but prohibited the analyst from testifying that the samples could have come from the same source. *Id.* at 1307. Even assuming the government could demonstrate that "consistent with" is sufficiently reliable for *Daubert* and Rule 702 purposes – it can't – the testimony must nevertheless be excluded because any probative value of the opinion testimony is outweighed by the risk of unfair prejudice, confusion, or undue consumption of time. Fed. R. Evid. 403. *See United States v. Tetiouxkhine*, 725 F.3d 1, 6 (1st Cir.2013) (scientific and technical evidence, "even if it passes the requirements of Rule 702, remains subject to Rule 403's balancing test."); *United States v. Chischilly*, 30 F.3d 1144, 1156 (9th Cir. 1994). In other words, "the expert's methods must be evaluated, not only for [this Court's] gatekeeping role, but also to understand the

impact of the evidence on the jury's job as the factfinder." *United States v. Green*, 405 F.Supp.2d 104, 119 (D. Mass., 2005).

Testimony of consistency between the recovered detritus and the items seized from 410 Norfolk Street without the context of empirical validation is scientifically meaningless and as a result cannot be helpful to the jury. As a hypothetical example, an analyst could testify that the phosphoric acid found at a crime scene was "chemically and physically consistent" with the phosphoric acid located at a defendant's residence. Given the scientific patina that attaches to the testimony presented by a forensic physical scientist, there is a substantial risk that the jury will simply nod its collective head and give the opinion significant credence. *See Green*, 405 F.Supp.2d at 117. The increased credence the testimony receives will linger long after the analyst points out that phosphoric acid is ubiquitous in soft drinks across the world, and that therefore the association is nearly meaningless. As Justice Blackmun emphasized in *Daubert*:

Rule 403 permits the exclusion of relevant evidence if its probative value is substantially outweighed by the danger of unfair prejudice, confusion of the issues, or misleading the jury... Expert evidence can be both powerful and quite misleading because of the difficulty in evaluating it. Because of this risk, the judge in weighing possible prejudice against probative force under Rule 403 of the present rules exercises more control over experts than over lay witnesses.

*Daubert*, 509 U.S. at 595 (citation omitted). More recently, Judge Selya has noted the heightened responsibility a trial court has to determine *Daubert* relevance before admitting questionable testimony:

Many aspects of science are a mystery to laymen without the aid of experts. In the world of the blind, the one-eyed man is king; and *Daubert* relevancy is the sentry that guards against the tyranny of experts. As the gatekeeper,



the trial judge has the duty to insulate the jury from expert testimony when reliance on authoritative studies and methods threatens to mask the lack of an adequate fit. An expert might be able to testify on the phases of the moon to prove that it was dark by a particular time, but he could not offer the same testimony to prove that a person was likely to act in an unusual manner on that night.

*Samaan v. St. Joseph Hosp.*, 670 F.3d 21, 32 (1st Cir. 2012).

So it is here. Without method validation, the testimony is unreliable and any probative value it might carry is far outweighed by the confusion, consumption of time, and undue prejudice it will bring with it. The testimony regarding the tape and silicon matches must therefore be excluded. Fed. R. Evid. 401, 403, 702.

#### **IV. AN EVIDENTIARY HEARING IS REQUIRED**

The lack of method validation supporting a conclusion of source-specific attribution for the tape and polymer matches implicates testability, peer review, error rate, standards, subjectivity and general acceptance, all factors the Court must consider and resolve to determine admissibility. Where, as here, a life may hang in the balance, this Court must vindicate the need for heightened reliability and confidence in the evidence presented to the jury. The Court must therefore, at a minimum, hold an evidentiary hearing to resolve this motion.

#### **CONCLUSION**

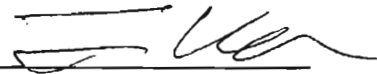
*Daubert* and Rule 702 mandate that this Court conduct a searching inquiry of any proposed expert testimony to ensure it is not only relevant but reliable. This inquiry, according to *Daubert*, should focus on such issues as testability, peer review, error rate, standards, and general acceptance. The lack of method validation demonstrates that the proposed



testimony does not satisfy these reliability factors and must therefore be excluded. In any event, the confusion, consumption of time, and undue prejudice the testimony will bring with it make it inadmissible pursuant to Rule 403, and it must therefore be excluded.

Respectfully submitted,

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/s/ Timothy G. Watkins